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APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
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EXAMINER
MORAN, TIMOTHY J

ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 02/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/628,116	SOBOLEWSKI ET AL.	
	Examiner	Art Unit	
	Timothy J. Moran	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 January 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1☐ Certified copies of the priority documents have been received.

2☐ Certified copies of the priority documents have been received in Application No. _____.

3☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5*
4)☐ Interview Summary (PTO-413) Paper No(s) _____
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3, and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Il'in, "Ultimate quantum efficiency of a superconducting hot-electron photodetector." Regarding claim 1, Il'in teaches a method of detecting photons, comprising the acts of providing a superconductor strip (p. 3938, col. 2, paragraph starting with "This letter," first sentence) with electrical biasing ("Jdc" source in fig. 1), with light directed onto said strip (optical fiber in fig. 1), where biasing is at a level near the superconducting strip's critical current (fig. 2 and p. 3939, col. 1 last paragraph – col. 2, first paragraph teach that the operating point (Bias current = 190 uA) is close to the critical current (~ 50 uA)), and where the detection sensitivity is sufficient to detect a single photon on the superconductor strip (p. 3940, col. 2, paragraph starting with "In this work," second sentence).

Regarding claim 3, Il'in (fig. 1) teaches the use of niobium nitride.

Regarding claim 4, Il'in (abstract, first sentence) teaches the detection of infrared radiation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoyle, U. S. Patent No. 4,037,102. Regarding claim 1, Hoyle teaches a method of detecting photons (col. 9, lines 32-34), comprising the acts of providing a superconductor strip (fig. 8, element 98, col. 8, lines 50-52), electrically biasing said superconductor strip (col. 10, lines 12-24), directing light onto said biased superconductor strip (col. 9, lines 32-34), wherein said biasing is at a level near said superconductor strip's critical current (col. 6, lines 8-19) to enable detection of very small energy amounts. Hoyle does not explicitly teach the use of this method for the detection of single photons, but one skilled in the art of light detectors would recognize the advantage of a detector with a sensitivity high enough to detect single photons. Hoyle does teach that strips with small widths are sensitive to lower energy impacts (col. 6, lines 19-37 and lines 42-46, and col. 9, lines 12-34, fig. 10). Thus, one skilled in the art would therefore understand that by properly decreasing the width of the channel (or strip), the detection of single photons has a reasonable chance of success. Therefore it would have been obvious to one of ordinary skill in the art to provide for the detection of a single photon in the method of Hoyle.

Regarding claim 2, Hoyle discusses the output pulse from the superconductor strip (col. 6, lines 33-42).

Regarding claim 3, niobium nitride is well known in the art as a superconductor material useful in detectors. Therefore it would have been obvious to one of ordinary skill in the art to provide for a superconductor strip of niobium nitride in the modified method of Hoyle.

Regarding claim 4, Hoyle teaches the use of lasers and equivalent sources of energy may be used with the detector method. The use of superconductor materials to detect infrared radiation is well known in the art. Therefore it would have been obvious to one of ordinary skill in the art to provide a single photon with a wavelength between the visible and the far infrared spectral regions in the modified method of Hoyle.

Regarding claim 5, Hoyle (fig. 9) teaches the use of a superconductor strip which defines a meander.

Regarding claim 6, Hoyle teaches the use of a strip with a width generally greater than or equal to 1 micron (col. 5, lines 35-41). However, Hoyle also teaches the advantage of using smaller widths with the advantage of the ability to detect smaller amounts of radiation (col. 9, lines 12-34, fig. 10). Therefore, it would have been obvious to one of ordinary skill in the art to provide for a superconductor strip with a width equal to or less than about 200 nm in the modified method of Hoyle.

Regarding claim 7, as described above, Hoyle describes a photon detector comprising a superconductor film coupled to a bias source, where said superconductor film is biased near its critical current. Hoyle also teaches the advantage of using strips

with small widths, which would indicate to one of ordinary skill in the art the likelihood of success of this method for the purpose of detecting single photons. Therefore it would have been obvious to one of ordinary skill in the art to provide for a superconducting film dimension which allows detection of a single incident photon in the device of Hoyle.

Regarding claim 8, niobium nitride is well known in the art as a superconductor material useful in detectors. Therefore it would have been obvious to one of ordinary skill in the art to provide for a superconductor strip of niobium nitride in the modified device of Hoyle.

Regarding claim 9, Hoyle teaches the use of a strip with a width generally greater than or equal to 1 micron (col. 5, lines 35-41). However, Hoyle also teaches the advantage of using smaller widths (col. 9, lines 12-34, fig. 10). Therefore, it would have been obvious to one of ordinary skill in the art to provide for a superconductor strip with a width equal to or less than about 200 nm in the modified device of Hoyle.

Regarding claim 10, Hoyle teaches the formation of a detectable resistive region upon absorption of an incident photon onto the superconducting film (col. 6, lines 8-37).

Regarding claim 11, Hoyle teaches (fig. 3, element 50 and neighboring film portions, col 4, lines 18-35) the use of wires coupled to pads at the ends of the superconducting film (64), and the use of such wires (50) to connect to the biasing source (col. 4, lines 13-17).

Regarding claim 12, Hoyle (fig. 9) teaches the use of a superconductor strip which defines a meander.

Regarding claim 13, Hoyle does not teach the use of gold in the contact pads, but does teach the use of "other conventional methods of securing leads at superconductive temperatures" (col. 4, lines 31-35). Gold is well known in the art as a useful material for achieving electrical contact to thin films. Therefore it would have been obvious to one of ordinary skill in the art to provide contact pads which include gold in the modified device of Hoyle to achieve good electrical contact.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hoyle as applied to claim 7 above, and further in view of Bornstein, U. S. Patent 4,987,305. Hoyle does not teach the coupling of light to the superconducting film using an optical fiber. However, Bornstein (fig. 3, abstract and col. 5, lines 44-55) teaches the coupling of light to an infrared detector (15) using an optical fiber (17) with the advantage of greater freedom in placement of detectors relative to light sources (col. 4, lines 3-10). Therefore it would have been obvious to one of ordinary skill in the art to provide for the coupling of light to the superconducting film using an optical fiber in the modified device of Hoyle for the advantage of greater freedom of structural design.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hoyle as applied to claim 7 above, and further in view of Weirauch, U. S. Patent No. 5,828,068. Hoyle does not teach the coupling of light to the superconducting film through a hemispherical lens. However, Weirauch (fig. 3) teaches the coupling of light to an infrared detector (10) through a hemispherical lens (18) for the advantage of collecting light from a large range of angles (col. 4, lines 27-30). Therefore it would have been obvious to one of ordinary skill in the art to provide for the coupling of light to the

superconducting film through a hemispherical lens in the modified device of Hoyle for the advantage of collecting infrared light from a wide range of angles.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Fenner, U. S. Patent No. 5,354,989 (abstract) and Culbertson, U. S. Patent No. 5,285,067 (claims 1 and 10) teach the use of superconductor materials to detect infrared radiation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy J. Moran whose telephone number is 703-305-0849. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seungsook Ham can be reached on 703-308-4090. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7724 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

SEUNGSOOK HAM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

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January 28, 2002